

### DESCRIPTION

Demonstration circuit 506A is a two-phase, step down charge pump DC/DC converter featuring the LTC3251EMSE. It produces regulated 1.5V output voltage at up to 500mA of output current from 3.2V to 5.5V input. A unique two phase, spread spectrum architecture of the LTC3251 provides highly efficient and low noise operation. The burst and super-burst operating modes also reduce operating current at light load conditions. The circuit has

a low external parts count and requires only four small surface mount capacitors. DC 506 demonstrates appropriate layout techniques for the LTC3251 Inductorless DC-DC converter. This power supply circuit is ideally suited for space-constrained battery-powered applications that require small size and low operating current.

**Design files for this circuit board are available. Call the LTC factory.**

### QUICK START PROCEDURE

Demonstration circuit DC506 is easy to set up to evaluate the performance of the LTC3251. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

**NOTE:**When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the VIN or VOUT and GND terminals. See Figure 2 for proper scope probe technique.

1. With power off, connect input power source to VIN and GND terminals. Input voltage range is limited to between 3.2V and 5.5V.
2. Place operation mode selector jumper JP1 in the GND position, JP2 in the VIN position for Burst Mode operation.
3. Connect load between the VOUT and GND terminals.
4. Turn on the power at the input.

**NOTE:**Make sure that the input voltage does not exceed 5.5V.

5. Check for the proper output voltages. VOUT = 1.5V.

If there is no output, temporarily disconnect the load to make sure that the load is not set too high.

6. Once the proper output voltages are established, adjust the loads up to 500mA and observe the output voltage regulation, input and output ripple voltage, efficiency and other parameters.

**NOTE:** IOUT derates linearly to 200mA for VIN less than 3.5V.

7. For continuous mode operation, set operation mode selector jumper JP1 in the VIN position, JP2 in the GND position. Please refer Table 1 for other modes of operation.

**Table 1. Modes of Operation:**

| JP1 | JP2 | MODE        |
|-----|-----|-------------|
| GND | GND | SHUTDOWN    |
| GND | VIN | BURST       |
| VIN | GND | CONTINUOUS  |
| VIN | VIN | SUPER BURST |

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 506

## 500mA SPREAD-SPECTRUM, LOW NOISE, INDUCTORLESS STEP DOWN DC/DC CONVERTER

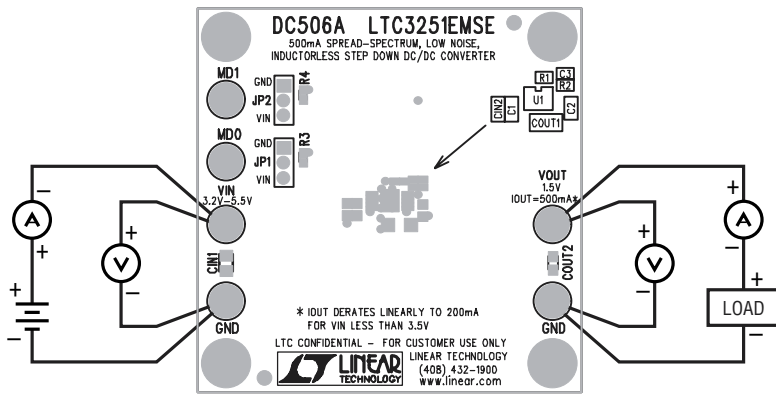


Figure 1. Proper Measurement Equipment Setup

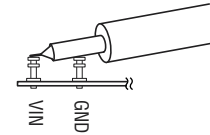


Figure 2. Scope Probe Placement for Measuring Input or Output Ripple

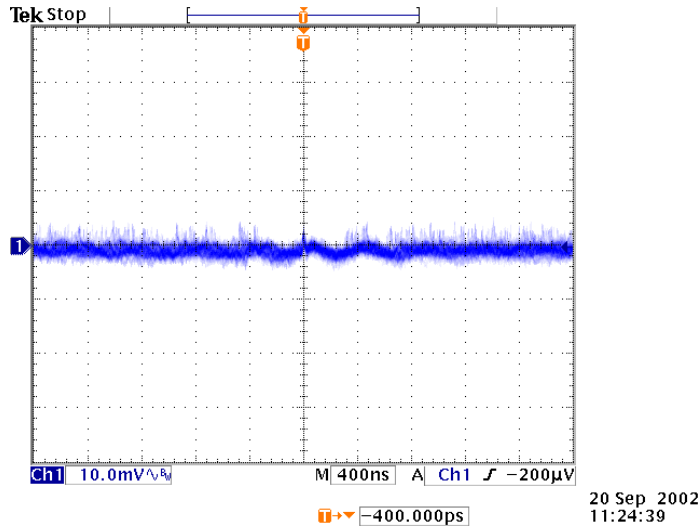


Figure 4. Input Ripple  
(VIN = 3.5V, IOUT = 500mA), 20MHz Bandwidth

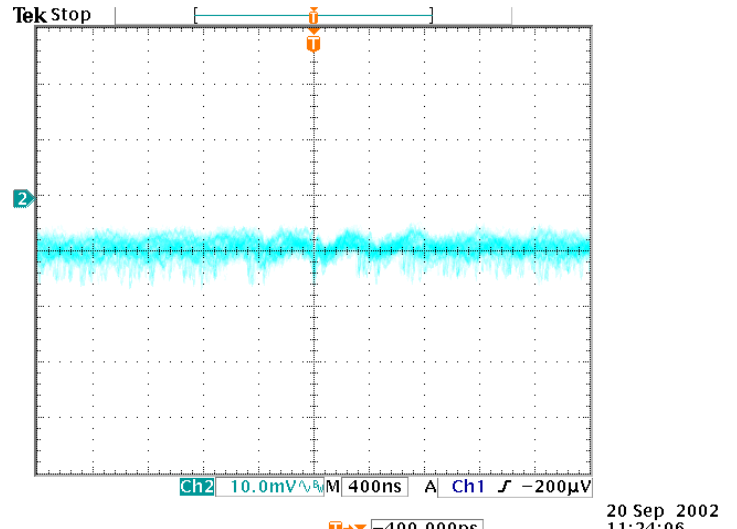
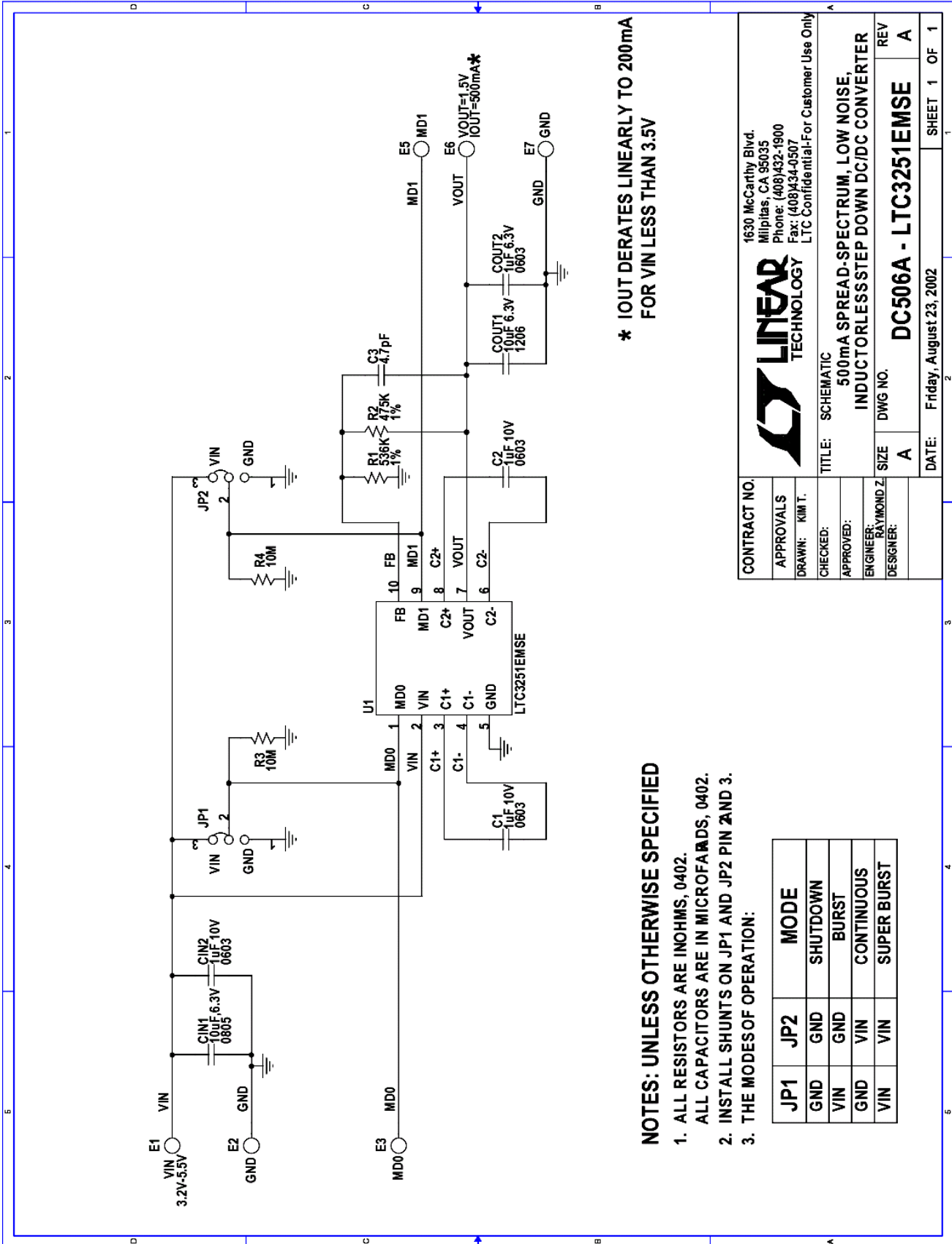


Figure 5. 1.5V Output Ripple  
(VIN = 3.5V, IOUT = 500mA), 20MHz Bandwidth

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 506

## 500mA SPREAD-SPECTRUM, LOW NOISE, INDUCTORLESS STEP DOWN DC/DC CONVERTER



\* IOUT DERATES LINEARLY TO 200mA FOR VIN LESS THAN 3.5V

### NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS, 0402.
2. ALL CAPACITORS ARE IN MICROFARADS, 0402.
3. INSTALL SHUNTS ON JP1 AND JP2 PIN 2 AND 3.
3. THE MODES OF OPERATION:

| JP1 | JP2 | MODE        |
|-----|-----|-------------|
| GND | GND | SHUTDOWN    |
| VIN | GND | BURST       |
| GND | VIN | CONTINUOUS  |
| VIN | VIN | SUPER BURST |

|                     |                         |   |                      |
|---------------------|-------------------------|---|----------------------|
| <b>CONTRACT NO.</b> |                         | 1630 McCarthy Blvd.<br>Milpitas, CA 95035<br>Phone: (408)432-1900<br>Fax: (408)434-0507<br>LTC Confidential-For Customer Use Only |                      |
| <b>APPROVALS</b>    |                         | <b>LINEAR TECHNOLOGY</b>  |                      |
| <b>DRAWN:</b>       | KIM T.                  | <b>TITLE:</b>   | SCHEMATIC            |
| <b>CHECKED:</b>     |                         | 500mA SPREAD-SPECTRUM, LOW NOISE,<br>INDUCTORLESS STEP DOWN DC/DC CONVERTER   |                      |
| <b>APPROVED:</b>    |                         | <b>SIZE</b>   | A                    |
| <b>ENGINEER:</b>    | RAYMOND Z.              | <b>DWG NO.</b>  | DC506A - LTC3251EMSE |
| <b>DESIGNER:</b>    |                         | <b>REV</b>  | A                    |
| <b>DATE:</b>        | Friday, August 23, 2002 | <b>SHEET</b>  | 1 OF 1               |

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 506

## 500mA SPREAD-SPECTRUM, LOW NOISE, INDUCTORLESS STEP DOWN DC/DC CONVERTER

**Linear Technology Corporation**  
**LTC3251EMSE**  
 500mA SPREAD-SPECTRUM, LOW NOISE,  
 INDUCTORLESS STEP DOWN DC/DC CONVERTER  
 ENG: RAYMOND Z.

**BILL OF MATERIALS**  
**DC506A**  
**QTY-825**  
 10/18/02  
 1:33 PM

| Item | Qty | Reference              | Part Description                                 | Manufacture / Part #       | Kit Qty    |
|------|-----|------------------------|--|----------------------------|------------|
|      |     |                        |  | <b>NUMBER OF BOARDS =</b>  | <b>825</b> |
| 1    | 1   | CIN1                   | CAP., X5R 10uF 6.3V, 0805                        | TAIYO YUDEN, JMK212BJ106MG | 825        |
| 2    | 3   | C1,C2,CIN2             | CAP., X5R 1uF 10V,0603                           | TAIYO YUDEN, LMK107BJ105MA | 2475       |
| 3    | 1   | COU1                   | CAP., X5R 10uF 6.3V,1206                         | TAIYO YUDEN, JMK316BJ106ML | 825        |
| 4    | 1   | COU2                   | CAP., X5R 1uF 6.3V,0603                          | TAIYO YUDEN, JMK107BJ105MA | 825        |
| 5    | 1   | C3                     | CAP., NPO 4.7pF 50V,0402                         | AVX, 04025A4R7CAT          | 825        |
| 6    | 6   | E1,E2,E3,E5,E6,E7      | TP, TURRET, .094"                                | MILL-MAX, 2501-2           | 4950       |
| 7    | 2   | JP1,JP2                | JMP, 1X3 PINS, .079                              | COMM CON, 2802S-03G2       | 1650       |
| 8    | 2   | SHUNTS FOR JP1 AND JP2 | SHUNT, 2 PINS, .079"                             | COMM CON, CCIJ2mm-138G     | 1650       |
| 9    | 1   | R1                     | RES, 536K 1%, 0402                               | AAC, CR05-5363FM           | 825        |
| 10   | 1   | R2                     | RES, 475K 1%, 0402                               | AAC, CR05-4753FM           | 825        |
| 11   | 2   | R3,R4                  | RES, 10M 5%, 0402                                | AAC, CR05-106JM            | 1650       |
| 12   | 1   | U1                     | IC, LTC3251EMSE, MSE10                           | LINEAR TECH., LTC3251EMSE  | 825        |
| 13   | 4   | MTG HOLES AT 4 CORNERS | STANDOFF, NYLON HEX #4-40 x 1/4"                 | MICRO PLASTICS, #14HTSP101 | 3300       |
| 14   | 4   |                        | SCREW, #4-40 x 1/4                               | ANY                        | 3300       |
|      |     |                        | <b>NOTES: UNLESS OTHERWISE SPECIFIED</b>         |                            |            |
|      |     |                        | 1. ALL RESISTORS ARE IN OHMS, 0402.              |                            |            |
|      |     |                        | 2. INSTALL SHUNTS ON JP1 AND JP2 PIN 2 AND 3.    |                            |            |
|      |     |                        | 3. INSTALL 4 STANDOFF COMPONENTS ON BOTTOM SIDE. |                            |            |

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 506

## 500MA SPREAD-SPECTRUM, LOW NOISE, INDUCTORLESS STEP DOWN DC/DC CONVERTER

### APPROVED VENDOR LIST

| VENDOR                | PHONE NUMBER   | PART TYPE              | WEBSITE ADDRESS |
|-----------------------|----------------|------------------------|-----------------|
| AAC (was TAD)         | (800) 508-1521 | CHIP RESISTORS         |                 |
| AAC (was TAD)         | (714) 255-9186 |                        |                 |
| AAVID                 | (714) 556-2665 | HEAT SINKS             |                 |
| ALLEN BRADLEY         | (800) 592-4888 | CARBON RESISTORS       |                 |
| AMP                   | (717) 564-0100 | PC MOUNT BNC           |                 |
| APEM                  | (718) 246-1007 | SMD TOGGLE/PB SWITCH   |                 |
| API DELEVAN           | (716) 652-3600 | INDUCTORS              |                 |
| AVX                   | (843) 946-0362 | CHIP CAPS              |                 |
| AVX                   | (843) 946-0524 | CHIP RESISTORS         |                 |
| AVX                   | (207) 282-5111 | TANTALUM CAPS          |                 |
| AVX                   | (843) 946-0323 | HIGH VOLTAGE CAPS      |                 |
| BERG                  | (800) 237-2374 | CONNECTORS             |                 |
| BH ELECTRONICS        | (952) 894-9590 | INDUCTORS              |                 |
| BI TECHNOLOGIES       | (714) 447-2656 | TRANSFORMERS           |                 |
| BI TECHNOLOGIES       | (714) 447-2345 | RES./RES. NETWORKS     |                 |
| BOURNS                | (801) 750-7253 | POTENTIOMETERS, SIPS   |                 |
| CADDOCK ELECTRONICS   | (541) 496-0700 | HIPO. RES., SIPS, DIPS |                 |
| CENTRAL SEMI          | (631) 435-1110 | SMALL SIGNAL DISCRETES |                 |
| CHICAGO MINIAT. LAMP  | (201) 489-8989 | LEDS                   |                 |
| COILCRAFT             | (847) 639-6400 | INDUCTORS              |                 |
| COMM CON              | (626) 301-4200 | HEADERS, SHUNTS        |                 |
| CONNEX                | (805) 378-6464 | BNC CONNECTORS         |                 |
| COOPER ELECT. TECH.   | (561) 752-5000 | INDUCTORS              |                 |
| CORNELL DUBILIER      | (508) 996-8561 | CAPACITORS             |                 |
| CTS                   | (219) 293-7511 | RESISTOR ARRAYS        |                 |
| CUI-STACK             | (503) 643-4899 | POWER CONNECTORS       |                 |
| DALE (see Vishay)     | (605) 665-1627 | INDUCTORS              |                 |
| DALE (see Vishay)     | (605) 665-9301 | SENSE RESISTORS        |                 |
| DATA DISPLAY PRODUCT  | (800) 421-6815 | LEDS                   |                 |
| DIODES INC.           | (805) 446-4800 | DIODES                 |                 |
| ELECTRONIC CONCEPTS   | (908) 542-7880 | 400V FILM CAPACITORS   |                 |
| EPSON                 | (310) 787-6300 | CRYSTALS               |                 |
| FAIRCHILD             | (207) 775-4502 | LOGIC                  |                 |
| FAIRCHILD             | (408) 822-2126 | MOSFETS                |                 |
| FAIRCHILD             | (888) 522-5372 | CRG (CUST. RESPONSE)   |                 |
| FCI                   | (717) 767-8005 | HOT PLUG CONNECTORS    |                 |
| FUKUSHIMA             | (818) 765-8300 | MPC RESISTORS          |                 |
| FUJI                  | (201) 712-0555 | SCHOTTKY DIODES        |                 |
| GENERAL SEMICONDUCTOR | (516) 847-3000 | DIODES                 |                 |
| GOWANDA               | (716) 532-2234 | INDUCTORS              |                 |
| GRAYHILL              | (708) 354-1040 | DIP SWITCHES           |                 |
| HARRIS                | (800) 442-7747 | LOGIC                  |                 |
| HEWLETT PACKARD       | (800) 235-0312 | IR LED                 |                 |
| HITACHI               | (408) 433-1990 | RF POWER AMPS          |                 |

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 506

## 500MA SPREAD-SPECTRUM, LOW NOISE, INDUCTORLESS STEP DOWN DC/DC CONVERTER

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|                    |                |                        |
|--------------------|----------------|------------------------|
| IDT                | (408) 727-6116 | LOGIC IC               |
| IR                 | (310) 322-3331 | MOSFETS                |
| IRC                | (361) 992-7900 | SENSE RESISTORS        |
| ITW PAKTRON        | (708) 667-3444 | CAPACITORS             |
| JOHNSON COMPONENTS | (650) 948-6533 | RF CONNECTORS          |
| JOHNSON COMPONENTS | (760) 434-5961 | RF CONNECTORS          |
| KEMET              | (408) 986-0424 | TANTALUM CAPS          |
| KEMET              | (864) 963-6300 | CRG (CUST. RESPONSE)   |
| KETEMA             | (714) 630-0081 | SURGE SUPPRESSORS      |
| KEYSTONE           | (718) 956-8900 | JACKS, TURRETS         |
| LITEON             | (408) 241-4588 | LEDS, DIODES           |
| LTC                | (408) 432-1900 | HIGH PERF. I.C.S       |
| MAGNETICS          | (800) 245-3984 | TOROID CORES ETC.      |
| MARCON             | (847) 696-2000 | HIGH C/V CAPACITORS    |
| METHODE            | (800) 323-6864 | ZIF SOCKETS            |
| MF ELECTRONICS     | (914) 576-6570 | CRYSTAL OSCILLATORS    |
| MICROCHIP          | (602) 786-7200 | MICROCONTROLLER IC     |
| MICRO PLASTICS     | (870) 453-8861 | NYLON STANDOFFS        |
| MICRO-SEMI         | (617) 926-0404 | DIODES                 |
| MIDCOM             | (605) 886-4385 | INDUCTORS              |
| MIDCOM             | (800) 643-2661 | INDUCTORS              |
| MILL-MAX           | (516) 922-6000 | TURRETS                |
| MINICIRCUITS       | (718) 934-4500 | RF TRANSFORMERS        |
| MOTOROLA           | (800) 441-2447 | LOGIC, REGS            |
| MURATA ELECTRONICS | (770) 436-1300 | CAPS., INDUCTORS,      |
| MURATA ELECTRONICS | (800) 831-9172 | CRG (CUST. RESPONSE)   |
| MURATA ELECTRONICS | (770) 433-5789 | RF DEVICES             |
| NEC/TOKIN          | (510) 324-4110 | INDUCTORS/HI C/V CAPS  |
| NICHIA             | (408) 573-0933 | WHITE LEDS             |
| NICHICON           | (847) 843-7500 | ELECTROLYTIC CAPACITOR |
| ON SEMICONDUCTOR   | (602) 244-6600 | DISCRETE DIODES ETC.   |
| ON SHORE           | (602) 921-3000 | TERMINATORS            |
| PANASONIC          | (714) 373-7334 | INDUCTORS, POLY CAPS   |
| PANASONIC          | (201) 348-5217 | LEDS                   |
| PANASONIC          | (201) 373-7334 | SWITCHES               |
| PERICOM            | (408) 435-0800 | LOGIC IC               |
| PHILIPS            | (914) 246-2811 | INDUCTORS              |
| PHILIPS            | (914) 247-2036 | PLANAR INDUCTORS       |
| PHILIPS            | (508) 851-2200 | DISCRETES, I.C.s       |
| PULSE              | (619) 674-8100 | INDUCTORS              |
| QT OPTOELECTRONICS | (408) 720-1440 | RF SWITCH              |
| RAYCHEM            | (800) 227-4856 | FUSES                  |
| RG ALLEN           | (818) 765-8300 | METAL OXIDE RESISTORS  |
| RF MICRO DEVICES   | (336) 664-1233 | RF2138 / RF2140        |
| SAMTEC             | (800) 726-8329 | WIRE JUMPERS           |
| SANYO              | (619) 661-6835 | OSCON CAPS             |
| SCHOTT             | (507) 532-3201 | INDUCTORS, XFORMERS    |

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 506

## 500MA SPREAD-SPECTRUM, LOW NOISE, INDUCTORLESS STEP DOWN DC/DC CONVERTER

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|                      |                |                          |
|----------------------|----------------|--------------------------|
| SCHURTER             | (707) 778-6311 | FUSES AND HOLDERS        |
| SIGNATRON            | (909) 464-1883 | DB9 CONNECTORS           |
| SIEMENS              | (108) 257-7910 | OPTO                     |
| SILICONIX            | (800) 554-5565 | MOSFETS                  |
| SILICONIX            | (408) 988-8000 | MOSFETS                  |
| SPRAGUE              | (207) 324-4140 | CAPACITORS               |
| SULLINS              | (760) 744-0125 | HEADERS, SHUNTS          |
| SUMIDA               | (847) 956-0667 | INDUCTORS                |
| SUMIDA               | (408) 982-9660 | INDUCTORS                |
| TAIYO YUDEN          | (408) 573-4150 | CHIP CAPS / RES.         |
| TAIYO YUDEN          | (800) 348-2496 | CRG (CUST. RESPONSE)     |
| TEKTRONIX            | (800) 835-9433 | SCOPE PROBE SOCKETS      |
| TEMIC                | (408) 970-5700 | IR PHOTO DIODE           |
| THERMALLOY           | (972) 243-4321 | HEAT SINKS               |
| THIN FILM TECHNOLOGY | (507) 625-8445 | THIN FILM CHIP RESISTORS |
| TOCOS                | (847) 884-6664 | SMD POTENTIOMETERS       |
| TOKIN (NEC)          | (510) 324-4110 | CAPS., INDUCTORS,        |
| TOKO                 | (847) 699-3430 | RF PRODUCTS              |
| TOSHIBA              | (714) 455-2000 | SINGLE GATE LOGIC        |
| TOSHIBA              | (949) 455-2000 | LOGIC                    |
| UNITED CHEMICON      | (847) 696-2000 | ELECTROLYTIC CAPACITOR   |
| VISHAY               | (605) 665-9301 | ZENER/SM. SIGNAL DIODES  |
| VISHAY               | (605) 665-9301 | INDUCTORS, SENSE Rs      |
| VITRAMON             | (203) 268-6261 | CERAMIC CHIP CAPACITOR   |
| WIMA                 | (914) 347-2474 | PAPER/FILM CAPACITORS    |
| ZETEX                | (631) 366-5068 | SMALL SIGNAL DISCRETES   |
| ZIERICK              | (800) 882-8020 | STAKED PINS              |

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 506

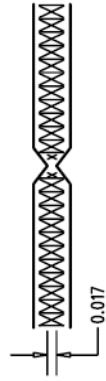
## 500mA SPREAD-SPECTRUM, LOW NOISE, INDUCTORLESS STEP DOWN DC/DC CONVERTER

| REVISIONS |                   |      |      |
|-----------|-------------------|------|------|
| REV       | DESCRIPTION       | APPR | DATE |
| A         | PROTOTYPE RELEASE |      |      |

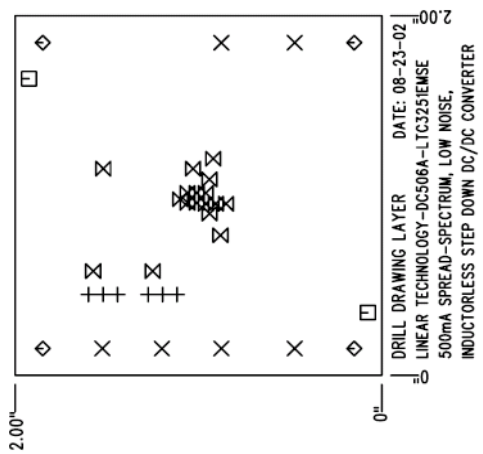
| SIZE  | QTY | SYM | PLTD  |
|-------|-----|-----|-------|
| 0.035 | 6   | +   | PLTD  |
| 0.094 | 6   | X   | PLTD  |
| 0.07  | 2   | □   | NPLTD |
| 0.125 | 4   | ◇   | PLTD  |
| 0.015 | 17  | ⊗   | PLTD  |

**NOTES : Unless Otherwise Specified**

1. MATERIAL : FR4 OR EQUIVALENT EPOXY, 2 OZ. COPPER CLAD THICKNESS .062 +/- .006 TOTAL OF 2 LAYERS.
2. FINISH : ALL PLATED HOLES .001 MIN. / .0015 MAX. COPPER PLATE ELECTRODEPOSITED TIN-LEAD COMPOSITION BEFORE REFLOW , SOLDER MASK OVER BARE COPPER (SNOBC).
3. SOLDER MASK : BOTH SIDES USING LPI OR EQUIVALENT.
4. SILKSCREEN : USING WHITE NON-CONDUCTIVE EPOXY INK.
5. UNUSED SMD COMPONENTS SHOULD BE FREE OF SOLDER.
6. FILL UP ALL VIAS WITH SOLDER.
7. SCORING:



8. PLEASE LOOK AT THE README FILE FOR THE OTHER REQUIREMENTS.



SHOWN FROM COMPONENT SIDE

| APPROVALS  |            | INIT               |  | DATE       |  |
|--|------------|--------------------|--|------------|--|
| DRAWN  |            |                    |  |            |  |
| CHECK  |            |                    |  |            |  |
| DESIGN   | KM T.      | 08-23-02           |  |            |  |
| ENGR   | RAYMOND Z. | 08-23-02           |  |            |  |
| TITLE: FABRICATION DRAWING<br>500mA SPREAD-SPECTRUM, LOW NOISE<br>INDUCTORLESS STEP DOWN DC/DC CONVERTER |            |                    |  |            |  |
| SIZE   | A          | DEMO               |  |            |  |
| REV.   | A          | DC506A-LTC3251EMSE |  |            |  |
| SCALE = NONE   |            | DES- 0000          |  | SHT 1 of 1 |  |

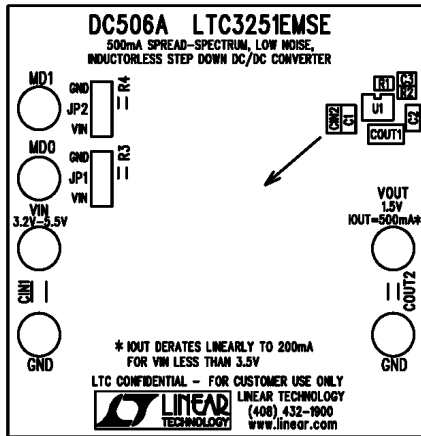


1630 McCarthy Blvd.  
Milpitas, CA 95035  
PH: (408)432-1900

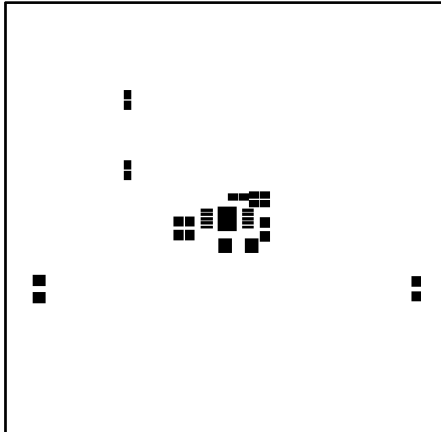


# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 506

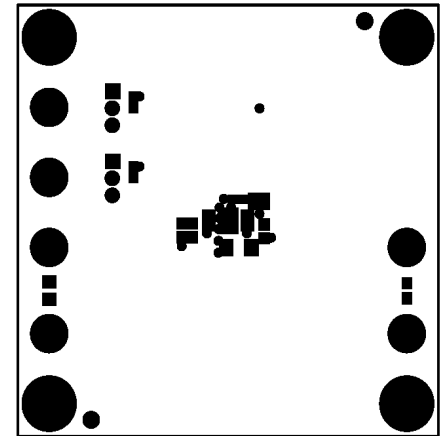
## 500mA SPREAD-SPECTRUM, LOW NOISE, INDUCTORLESS STEP DOWN DC/DC CONVERTER



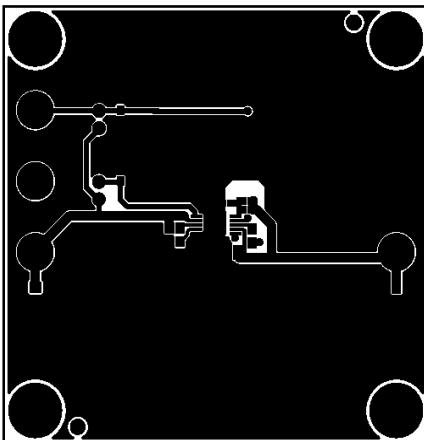
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LINEAR TECHNOLOGY-DC506A-LTC3251EMSE  
500mA SPREAD-SPECTRUM, LOW NOISE,  
INDUCTORLESS STEP DOWN DC/DC CONVERTER



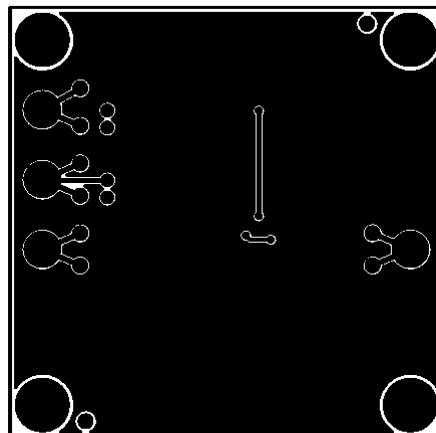
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500mA SPREAD-SPECTRUM, LOW NOISE,  
INDUCTORLESS STEP DOWN DC/DC CONVERTER



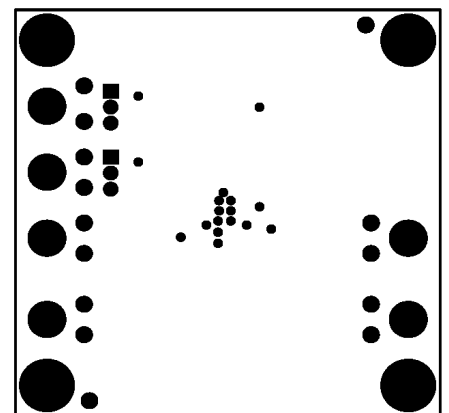
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LINEAR TECHNOLOGY-DC506A-LTC3251EMSE  
500mA SPREAD-SPECTRUM, LOW NOISE,  
INDUCTORLESS STEP DOWN DC/DC CONVERTER



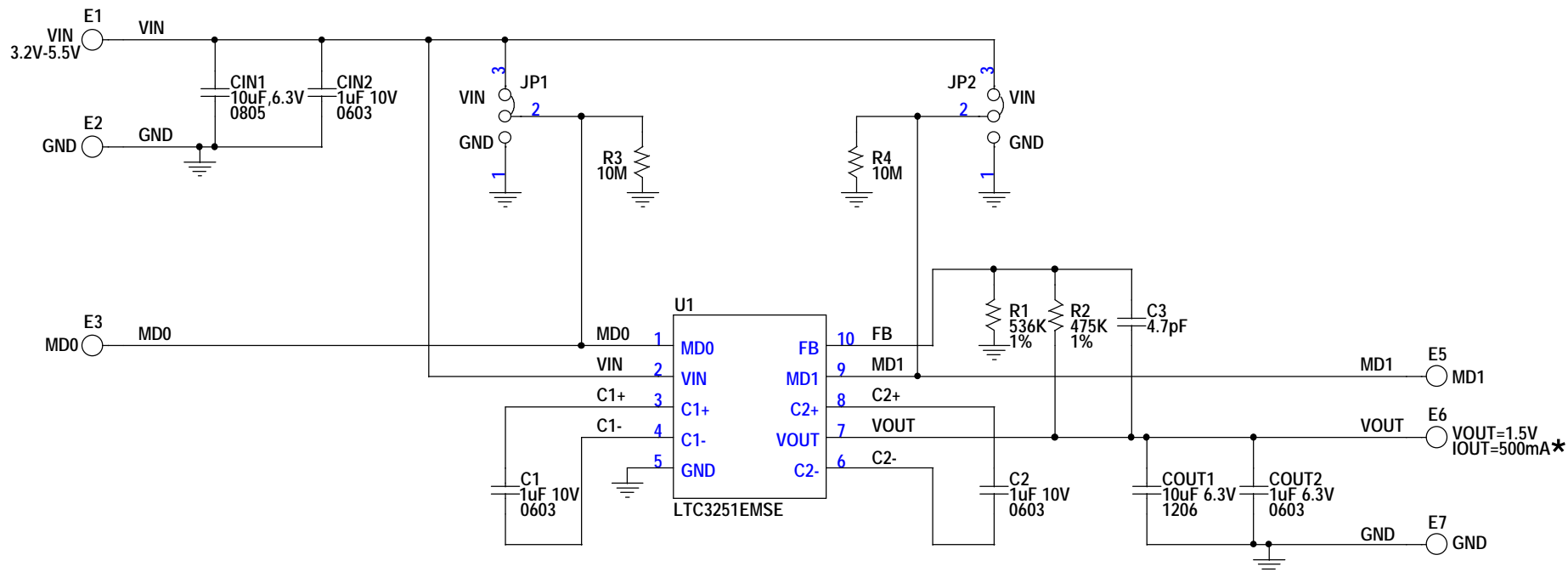
LAYER 1 - TOP LAYER DATE: 08-23-02  
LINEAR TECHNOLOGY-DC506A-LTC3251EMSE  
500mA SPREAD-SPECTRUM, LOW NOISE,  
INDUCTORLESS STEP DOWN DC/DC CONVERTER



LAYER 2 - BOTTOM LAYER DATE: 08-23-02  
LINEAR TECHNOLOGY-DC506A-LTC3251EMSE  
500mA SPREAD-SPECTRUM, LOW NOISE,  
INDUCTORLESS STEP DOWN DC/DC CONVERTER



BOTTOM SOLDER MASK DATE: 08-23-02  
LINEAR TECHNOLOGY-DC506A-LTC3251EMSE  
500mA SPREAD-SPECTRUM, LOW NOISE,  
INDUCTORLESS STEP DOWN DC/DC CONVERTER




\* IOUT DERATES LINEARLY TO 200mA  
FOR VIN LESS THAN 3.5V

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1. ALL RESISTORS ARE IN OHMS, 0402.  
ALL CAPACITORS ARE IN MICROFARADS, 0402.
2. INSTALL SHUNTS ON JP1 AND JP2 PIN 2 AND 3.
3. THE MODES OF OPERATION:

| JP1 | JP2 | MODE        |
|-----|-----|-------------|
| GND | GND | SHUTDOWN    |
| VIN | GND | BURST       |
| GND | VIN | CONTINUOUS  |
| VIN | VIN | SUPER BURST |

|                      |   |   |        |
|----------------------|---|---|--------|
| CONTRACT NO.         | <br><b>LINEAR TECHNOLOGY</b> | 1630 McCarthy Blvd.<br>Milpitas, CA 95035<br>Phone: (408)432-1900<br>Fax: (408)434-0507<br>LTC Confidential-For Customer Use Only |        |
| APPROVALS            |   |   |        |
| DRAWN: KIM T.        |   |   |        |
| CHECKED:             |   |   |        |
| APPROVED:            | TITLE: SCHEMATIC  |   |        |
| ENGINEER: RAYMOND Z. | 500mA SPREAD-SPECTRUM, LOW NOISE,<br>INDUCTORLESS STEP DOWN DC/DC CONVERTER                                       |   |        |
| DESIGNER:            | SIZE: A   | DWG NO. DC506A - LTC3251EMSE  | REV: A |
|                      | DATE: Friday, August 23, 2002   | SHEET 1 OF 1  |        |

# Linear Technology Corporation

LTC3251EMSE

500mA SPREAD-SPECTRUM, LOW NOISE,  
INDUCTORLESS STEP DOWN DC/DC CONVERTER  
ENG: RAYMOND Z.

BILL OF MATERIALS

DC506A

6/17/2005

12:54 PM

| <i>Item</i>   | <i>Qty</i> | <i>Reference</i>       | <i>Part Description</i>          | <i>Manufacture / Part #</i> |
|---|------------|------------------------|----------------------------------|-----------------------------|
| 1   | 1          | CIN1                   | CAP., X5R 10uF 6.3V, 0805        | TAIYO YUDEN, JMK212BJ106MG  |
| 2   | 3          | C1,C2,CIN2             | CAP., X5R 1uF 10V,0603           | TAIYO YUDEN, LMK107BJ105MA  |
| 3   | 1          | COUT1                  | CAP., X5R 10uF 6.3V,1206         | TAIYO YUDEN, JMK316BJ106ML  |
| 4   | 1          | COUT2                  | CAP., X5R 1uF 6.3V,0603          | TAIYO YUDEN, JMK107BJ105MA  |
| 5   | 1          | C3                     | CAP., NPO 4.7pF 50V,0402         | AVX, 04025A4R7CAT           |
| 6   | 6          | E1,E2,E3,E5,E6,E7      | TP, TURRET, .094"                | MILL-MAX, 2501-2            |
| 7   | 2          | JP1,JP2                | JMP, 1X3 PINS, .079              | COMM CON, 2802S-03G2        |
| 8   | 2          | SHUNTS FOR JP1 AND JP2 | SHUNT, 2 PINS, .079"             | COMM CON, CCIJ2mm-138G      |
| 9   | 1          | R1                     | RES, 536K 1%, 0402               | AAC, CR05-5363FM            |
| 10  | 1          | R2                     | RES, 475K 1%, 0402               | AAC, CR05-4753FM            |
| 11  | 2          | R3,R4                  | RES, 10M 5%, 0402                | AAC, CR05-106JM             |
| 12  | 1          | U1                     | IC, LTC3251EMSE, MSE10           | LINEAR TECH., LTC3251EMSE   |
| 13  | 4          | MTG HOLES AT 4 CORNERS | STANDOFF, NYLON HEX #4-40 x 1/4" | MICRO PLASTICS, #14HTSP101  |
| 14  | 4          |                        | SCREW, #4-40 x 1/4               | ANY                         |
| <b>NOTES: UNLESS OTHERWISE SPECIFIED</b>                |            |                        |                                  |                             |
| <b>1. ALL RESISTORS ARE IN OHMS, 0402.</b>              |            |                        |                                  |                             |
| <b>2. INSTALL SHUNTS ON JP1 AND JP2 PIN 2 AND 3.</b>    |            |                        |                                  |                             |
| <b>3. INSTALL 4 STANDOFF COMPONENTS ON BOTTOM SIDE.</b> |            |                        |                                  |                             |